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EXAMINER	
THOMPSON, JAMES A	
ART UNIT	**PAPER NUMBER**
2624	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/632,809	YAMAMOTO, AKIO	
	Examiner	Art Unit	
	James A. Thompson	2624	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 July 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) _____ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-9,11-17,19-21 and 24-29* is/are rejected.

7)☒ Claim(s) *22,23,30 and 31* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *04 August 2000* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments filed 07 July 2005 have been fully considered but they are not persuasive.

While Examiner agrees with Applicant that the present amendments to the claims overcome the prior art previously applied to the prior art rejections, additional prior art cited in an earlier office action (Lohmeyer (US Patent 6,061,477), cited in item 6 of the office action dated 24 February 2004) renders the amended claims obvious to one of ordinary skill in the art at the time of the invention. Detailed rejections of the claims are given below.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claim 27 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claim 27 recites a processor arranged for performing the method of claim 21. However, a processor requires a computer-readable medium storing computer software comprising the software code needed in order to execute

the method. Thus, claim 27 as currently recited would not enable one of ordinary skill in the art to make and/or use the invention.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1, 3, 6-8, 12, 15-17 and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lathrop (US Patent 5,097,427) in view of Lohmeyer (US Patent 6,061,477) and Curry (US Patent 5,696,604).

Regarding claims 1, 12 and 20: Lathrop discloses a system (figure 1 of Lathrop) comprising a processor (figure 1(4) of Lathrop) programmed to warp an initial line pattern of the original image (figure 2; figure 4; and column 4, line 64 to column 5, line 2 of Lathrop) based on pixel values of the original image (column 4, lines 60-63 of Lathrop) to produce a warped line pattern (column 5, line 68 to column 6, line 7 of Lathrop), and to map an original image onto the warped line pattern (figure 2 and column 5, lines 57-60 of Lathrop) to produce a halftone image (column 5, lines 36-39 of Lathrop), the mapping including a comparison of the pixel values of the original image with pixel values of the warped line pattern (column 5, lines 57-60 and column 6, lines 60-64 of Lathrop).

Said processor generates texture table parameters U and V (column 4, lines 64-66 of Lathrop), both of which are functions of coordinate values X and Y (column 4, line 67 to column 5, line 2 of Lathrop), and their corresponding derivatives with respect to both coordinate values X and Y (column 4, lines 66-67 of Lathrop). Said texture table parameter values are first mapped onto the object space of the image (figure 2(a-c) and column 5, lines 57-60 of Lathrop). Defining a texture pattern in UV-space (column 6, lines 60-64 of Lathrop) and mapping said pattern onto object space is the same as warping an initial line to produce a warped line pattern, since said texture pattern is ultimately warped with respect to XY-space used for the image (figure 2(a-c) and column 5, line 68 to column 6, line 7 of Lathrop). Said object space is defined by three-dimensional coordinates (figure 2b and column 5, lines 66-68 of Lathrop).

The image display space is a two-dimensional space (figure 2c and column 6, lines 4-7 of Lathrop). The shape of said object space inherently alters the pixel values in said image display space since the shape of said object space must be mapped to the two-dimensional image display space to form a two-dimensional image (column 5, line 68 to column 6, line 7 of Lathrop). If the texture from said texture space is a unit value rectangle, which would therefore not alter the image at all, then the resultant image does not change. The resultant image in this case is the original image, which would be the pixel values depicting an image with a particular three-dimensional shape. For a texture space that contains non-unit values, then the resultant image is changed. Since said texture space is warped across said object space (column 5, line 68 to column 6, line 2 of Lathrop), then the initial line pattern is

therefore warped based upon pixel values of the original image. Further, said derivatives are also comparison values between the original image pixel values and the warped line pixel values since said derivatives are measures of how much the original pixel values change when mapped from the original two-dimensional space (figure 2a of Lathrop) to the final two-dimensional space, (figure 2b of Lathrop). Therefore, said warping is also performed based on a comparison of original image pixel values and warped line pixel values. Said processor is further programmed to map an original image onto said warped line pattern (figure 2(a-c) and column 5, lines 57-60 of Lathrop). Said texture pattern is mapped from the object space to the image space (column 5, line 66 to column 6, line 7 of Lathrop), producing a textured image (figure 2c of Lathrop).

Lathrop does not disclose expressly that said initial line pattern is warped based on pixel *brightness* values; and that said produced halftone image is an engraving-style halftone image.

Lohmeyer discloses warping image data (column 5, lines 32-36 and column 6, lines 20-23 of Lohmeyer) based on pixel brightness values (column 13, line 63 to column 14, line 6 of Lohmeyer). A luminance value is a measure of the brightness of a pixel based on the constraints of the computer measurements.

Lathrop and Lohmeyer are combinable because they are from the same field of endeavor, namely warping digital image data. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to further warp the line pattern taught by Lathrop based on the pixel brightness values, as taught by Lohmeyer. The motivation for doing so would have been that warping based on the interpolated warping of pixel

brightness values uses less memory and processes faster (column 2, lines 10-17 of Lohmeyer). Therefore, it would have been obvious to combine Lohmeyer with Lathrop.

Lathrop in view of Lohmeyer does not disclose expressly that said produced halftone image is an engraving-style halftone image.

Curry discloses producing a computer-generated engraving plate (column 3, lines 64-66 of Curry), which is formed from halftone data (column 3, lines 60-65 of Curry).

Lathrop in view of Lohmeyer is combinable with Curry because they are from the same field of endeavor, namely digital image processing. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to warp the image based on a texture, as taught by Lathrop, in the form of the halftone pattern that would be required to make an engraving plate, as taught by Curry. The motivation for doing so would have been to provide a desired texture pattern that can then be stored and selected for use in the system taught by Lathrop (column 2, lines 66-68 of Lathrop). Therefore, it would have been obvious to combine Curry with Lathrop in view of Lohmeyer to obtain the invention as specified in claims 1, 12 and 20.

Further regarding claim 1: The system of claim 12 performs the method of claim 1.

Further regarding claim 20: Lathrop discloses the use of computational and storage resources (column 7, line 63 to column 8, line 2 of Lathrop). "Storage resources" would inherently be some form of computer-readable medium since computer graphics computations are to be performed (column 7, line 67 to column 8, line 2 of Lathrop). Performing computations on a computer

inherently requires instructions in some form on said computer-readable medium. The computer-readable medium of claim 20 embodies the computer instructions for performing the method of claim 1.

Regarding claim 3: Lathrop discloses that the texture lookup table module (figure 5(30) of Lathrop) stores multiple texture lookup tables (column 5, lines 5-7 of Lathrop) and utilizes a MAP SELECT signal generated by the map selector module (figure 5(28) of Lathrop) (column 5, lines 7-12 of Lathrop). One example texture pattern is a rectangular grid (figure 2a and column 5, lines 61-63 of Lathrop). Two other texture patterns are shown in figure 4 of Lathrop, the texture used in each section of the image determined by a texture mapped flag (column 6, lines 17-20 of Lathrop). Both of the texture patterns shown in figure 4 of Lathrop are clearly oriented substantially along an initial direction of the original image. The texture pattern shown that is comprised substantially of horizontal lines is specifically considered here (figure 4 of Lathrop). Said texture pattern is mapped onto the object space (column 5, lines 64-66 of Lathrop), thus warping said texture pattern (column 5, line 68 to column 6, line 3 of Lathrop). The rectangular grid texture pattern shown specifically in figure 2a of Lathrop is warped by said object space shown in figure 2b of Lathrop (column 5, line 64 to column 6, line 3 of Lathrop). As can clearly be seen from figure 2c of Lathrop, said warping is performed in a direction that is substantially orthogonal to the original directions of the rectangular grid. For said texture pattern that is being specifically considered here, which substantially spans the horizontal direction, this would inherently result in said texture pattern being warped

substantially in the vertical direction. Furthermore, said warping is performed to assist in producing the warped line pattern (figure 2 and column 5, line 64 to column 6, line 3 of Lathrop), wherein said warped line pattern is specifically the warped line brightness pattern taught by Lathrop in view of Lohmeyer, as discussed above in the arguments regarding claims 1, 12 and 20.

Regarding claims 6 and 15: Lathrop discloses that partial derivative signals are calculated (column 4, lines 64-68 of Lathrop), said signals being a function of the pixel locations (column 4, line 68 to column 5, line 2 of Lathrop). The texture signals U and V, and their partial derivatives with respect to X and Y, are used to generate X and Y location values for a texture look-up table (column 6, lines 61-64 of Lathrop). Since the X and Y coordinates of the image are defined by a mapping from the three-dimensional object space (column 5, line 66 to column 6, line 3 of Lathrop), the geometry of said object space inherently affects the pixel values of the two-dimensional image display space (column 6, lines 4-7 of Lathrop). The pixel values of the image display space (figure 2c of Lathrop) render in two dimensions the three-dimensional object in object space (figure 2b of Lathrop) (column 6, lines 4-7 of Lathrop). Furthermore, using the partial derivative values dU/dX, dU/dY, dV/dX and dV/dY is the same as using the gradient for a two-dimensional space, $\vec{\nabla}\psi = \frac{\partial\psi}{\partial x}\hat{e}_x + \frac{\partial\psi}{\partial y}\hat{e}_y$. Computing the X and Y values for warping the texture pattern to the image display space by using the partial derivatives dU/dX, dU/dY, dV/dX and dV/dY is therefore a warping of the initial line pattern of the original

image based on gradient information computed from the pixel values of the original image.

Lathrop does not disclose expressly that said pixel values are pixel brightness values; and that said gradient information is brightness gradient information.

Lohmeyer discloses warping image data (column 5, lines 32-36 and column 6, lines 20-23 of Lohmeyer) based on pixel brightness values (column 13, line 63 to column 14, line 6 of Lohmeyer). A luminance value is a measure of the brightness of a pixel based on the constraints of the computer measurements.

Lathrop and Lohmeyer are combinable because they are from the same field of endeavor, namely warping digital image data. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to use pixel brightness values, and thus also brightness gradient information, as taught by Lohmeyer. The motivation for doing so would have been that warping based on the interpolated warping of pixel brightness values uses less memory and processes faster (column 2, lines 10-17 of Lohmeyer). Therefore, it would have been obvious to combine Lohmeyer with Lathrop to obtain the invention as specified in claims 6 and 15.

Further regarding claims 7 and 16: Lathrop discloses that said partial derivatives are used to interpolate X and Y address values in the image display plane for corresponding pixels in the U-V texture plane (column 6, lines 60-64 of Lathrop). The operation of interpolation inherently involves a weighted averaging of neighboring values, in this case gradient values (column 6, lines 60-64 of Lathrop). Therefore, for particular pixel locations of the original image, brightness gradient information is computed based on a weighted average of

brightness gradient information of the original image (column 6, lines 60-64 of Lathrop) computed from neighboring pixel brightness values of the original image (column 5, lines 3-5 of Lathrop).

Regarding claims 8 and 17: Lathrop discloses that texture signals U and V are used to generate X and Y location values for a texture look-up table (column 6, lines 61-64 of Lathrop). Since the X and Y coordinates of the image are defined by a mapping from the three-dimensional object space (column 5, line 66 to column 6, line 3 of Lathrop), the geometry of said object space inherently affects the pixel values of the two-dimensional image display space (column 6, lines 4-7 of Lathrop). The pixel values of the image display space (figure 2c of Lathrop) render in two dimensions the three-dimensional object in object space (figure 2b of Lathrop) (column 6, lines 4-7 of Lathrop). If a texture pattern such as the horizontal pattern shown in figure 4 of Lathrop is used, then computing the X values (X being the horizontal direction) for warping the texture pattern to said image display space is a warping of the initial line pattern of the original image based on a set of displacement values computed for pixel locations along each line of the initial line pattern of the original image, since said displacement values would determine precisely how the texture values are to be mapped (column 5, line 68 to column 6, line 7 of Lathrop).

6. Claims 4-5, 9 and 13-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lathrop (US Patent 5,097,427) in view of Lohmeyer (US Patent 6,061,477), Curry (US Patent 5,696,604), and Arnold (US Patent 5,929,866).

Regarding claims 4 and 13: Lathrop discloses that an initial line pattern is warped based on an original image (column 5, line 68 to column 6, line 7 of Lathrop).

Lathrop in view of Lohmeyer and Curry does not disclose expressly that said warping of said initial line is based upon a brightness density map extracted from the pixel brightness values of the original image, the brightness density map being a representation of the brightness of pixels along a line of the initial line pattern of the original image.

Arnold discloses creating a density map (figure 1a(30) of Arnold), said density map being extracted from pixel data (column 4, lines 38-44 of Arnold) and at a lower resolution than the image data that said density map represents (column 4, lines 29-33 of Arnold). Adjustments are made to an image based upon either said density map as a whole or upon selected portions of said density map (column 4, lines 51-55 of Arnold).

Lathrop in view of Lohmeyer and Curry is combinable with Arnold because they are from the same field of endeavor, namely image processing. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to warp the initial pattern line, as taught by Lathrop, based on a density map generated in the manner taught by Arnold. The density map would be a brightness density map since the pixel values taught by Lathrop are brightness pixel values according to the teachings of Lohmeyer. Furthermore, said brightness density map would be a representation of the brightness of pixels along a line of the initial line pattern of the original image since the density map taught by Arnold is used as the basis to warp the initial line pattern of the original image taught by Lathrop. The motivation for doing so would have been

to be able to efficiently adjust for fading (column 5, lines 54-58 of Arnold) and prevent aliasing in the output (column 2, lines 19-27 of Arnold). Therefore, it would have been obvious to combine Arnold with Lathrop in view of Lohmeyer and Curry to obtain the invention as specified in claims 4 and 13.

Further regarding claims 5 and 14: Arnold discloses producing said brightness density map by sampling the pixel brightness values of the original image (column 4, lines 29-33 of Arnold). Said brightness density map is created at a lower resolution than the output device, and is thus computed from a plurality of elements (column 4, lines 29-33 of Arnold).

Regarding claim 9: Lathrop discloses that an initial line pattern is warped based on an original image (column 5, line 68 to column 6, line 7 of Lathrop).

Lathrop in view of Lohmeyer and Curry does not disclose expressly that said initial line pattern of the original image is warped by inserting or removing one or more lines between adjacent lines of the initial line pattern of the original image.

Arnold discloses producing a density map at a lower resolution than the output device, using a plurality of neighboring pixel values (column 4, lines 29-33 of Arnold). Creating said density map for the output device at the output resolution would therefore inherently require the removal of one or more lines between adjacent lines in order for said density map to be at a lower resolution that the original image.

Lathrop in view of Lohmeyer and Curry is combinable with Arnold because they are from the same field of endeavor, namely image processing. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to warp

the initial pattern line of the original image, as taught by Lathrop, based on a density map generated in the manner taught by Arnold. Doing so would then inherently require the warping of the initial line pattern of the original image by removing one or more lines between adjacent lines of the initial line pattern of the original image, since said density map would be at a lower resolution than the input image data. The motivation for doing so would have been to be able to efficiently adjust for fading (column 5, lines 54-58 of Arnold) and prevent aliasing in the output (column 2, lines 19-27 of Arnold). Therefore, it would have been obvious to combine Arnold with Lathrop in view of Curry to obtain the invention as specified in claim 9.

7. Claims 11, 19, 21, 24-25 and 27-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lathrop (US Patent 5,097,427) in view of Lohmeyer (US Patent 6,061,477), Curry (US Patent 5,696,604), and Smitt (US Patent 5,988,504).

Regarding claims 11 and 19: Lathrop in view of Lohmeyer and Curry does not disclose expressly that said original image is mapped onto said warped line brightness pattern by producing black pixel values of the engraving-style image at pixel locations where the pixel brightness values of the original image are less than the corresponding pixel brightness values of the warped line brightness pattern, and producing white pixel values of the engraving-style image at pixel locations where the pixel brightness values of the original image are greater than or equal to the corresponding pixel brightness values of the warped line brightness pattern.

Smitt discloses that, if the grayscale value of the original image pixel exceeds the threshold value (warped pixel value), then the output pixel for said original image pixel will be white (column 4, lines 48-50 of Smitt). Otherwise, said output pixel will be black (column 4, line 50 of Smitt).

Lathrop in view of Lohmeyer and Curry is combinable with Smitt because they are from the same field of endeavor, namely halftone image processing. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to output a white pixel if the pixel brightness value of the original image taught by Lathrop in view of Lohmeyer is greater than the corresponding pixel brightness values of the warped line brightness pattern, also taught by Lathrop in view of Lohmeyer, and a black pixel otherwise, said white pixel and said black pixel being of the engraving style image, as taught by Curry. Said warped image pixel brightness value is used as the threshold value. The motivation for doing so would have been that the aforementioned thresholding scheme is useful for creating the halftone dots needed for sending the required halftone output to a printer (column 4, lines 50-53 of Smitt). Therefore, it would have been obvious to combine Smitt with Lathrop in view of Lohmeyer and Curry to obtain the invention as specified in claims 11 and 19.

Regarding claims 21, 27, 28 and 29: Lathrop discloses a system (figure 1 of Lathrop) comprising a processor (figure 1(4) of Lathrop) programmed to respond to pixel values of the original image (column 4, lines 60-63 of Lathrop) to produce a horizontally and vertically warped line pattern (figure 2 and column 5, line 68 to column 6, line 7 of Lathrop) including a series of warped lines representing warped brightness values of

the pixels of the original image (figure 2; figure 4; and column 4, line 64 to column 5, line 2 of Lathrop); and compare the values of pixels of the original image to the values of spatially corresponding pixels of the horizontally and vertically warped line pattern (column 5, lines 57-60 and column 6, lines 60-64 of Lathrop) to produce a halftone image (column 5, lines 36-39 of Lathrop).

Said processor generates texture table parameters U and V (column 4, lines 64-66 of Lathrop), both of which are functions of coordinate values X and Y (column 4, line 67 to column 5, line 2 of Lathrop), and their corresponding derivatives with respect to both coordinate values X and Y (column 4, lines 66-67 of Lathrop). Said texture table parameter values are first mapped onto the object space of the image (figure 2(a-c) and column 5, lines 57-60 of Lathrop). Defining a texture pattern in UV-space (column 6, lines 60-64 of Lathrop) and mapping said pattern onto object space is the same as warping an initial line to produce a warped line pattern, since said texture pattern is ultimately warped with respect to XY-space used for the image (figure 2(a-c) and column 5, line 68 to column 6, line 7 of Lathrop). Said object space is defined by three-dimensional coordinates (figure 2b and column 5, lines 66-68 of Lathrop).

The image display space is a two-dimensional space (figure 2c and column 6, lines 4-7 of Lathrop). The shape of said object space inherently alters the pixel values in said image display space since the shape of said object space must be mapped to the two-dimensional image display space to form a two-dimensional image (column 5, line 68 to column 6, line 7 of Lathrop). If the texture from said texture space is a unit value rectangle, which would therefore not alter the image at

all, then the resultant image does not change. The resultant image in this case is the original image, which would be the pixel values depicting an image with a particular three-dimensional shape. For a texture space that contains non-unit values, then the resultant image is changed. Since said texture space is warped across said object space (column 5, line 68 to column 6, line 2 of Lathrop), then the initial line pattern is therefore warped based upon pixel values of the original image. Further, said derivatives are also comparison values between the original image pixel values and the warped line pixel values since said derivatives are measures of how much the original pixel values change when mapped from the original two-dimensional space (figure 2a of Lathrop) to the final two-dimensional space (figure 2b of Lathrop). Therefore, said warping is also performed based on a comparison of original image pixel values and warped line pixel values. Said processor is further programmed to map an original image onto said warped line pattern (figure 2(a-c) and column 5, lines 57-60 of Lathrop). Said texture pattern is mapped from the object space to the image space (column 5, line 66 to column 6, line 7 of Lathrop), producing a textured image (figure 2c of Lathrop).

Lathrop does not disclose expressly that said initial line pattern is warped in response to pixel *brightness* values; and that said halftone image is an engraving-style halftone image such that (a) pixels of the engraving-style halftone image that spatially correspond with pixels of the original image are black in response to the spatially corresponding pixels of the original image having a brightness value less than the brightness value of the spatially corresponding pixels of the horizontally and vertically warped line pattern and (b) pixels

of the engraving-style halftone image that spatially correspond with pixels of the original image are white in response to the spatially corresponding pixels of the original image having a brightness value greater than or equal to the brightness value of the spatially corresponding pixels of the horizontally and vertically warped line pattern.

Lohmeyer discloses warping image data (column 5, lines 32-36 and column 6, lines 20-23 of Lohmeyer) based on pixel brightness values (column 13, line 63 to column 14, line 6 of Lohmeyer). A luminance value is a measure of the brightness of a pixel based on the constraints of the computer measurements.

Lathrop and Lohmeyer are combinable because they are from the same field of endeavor, namely warping digital image data. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to further warp the line pattern taught by Lathrop based on the pixel brightness values, as taught by Lohmeyer. The motivation for doing so would have been that warping based on the interpolated warping of pixel brightness values uses less memory and processes faster (column 2, lines 10-17 of Lohmeyer). Therefore, it would have been obvious to combine Lohmeyer with Lathrop.

Lathrop in view of Lohmeyer does not disclose expressly that said halftone image is an engraving-style halftone image such that (a) pixels of the engraving-style halftone image that spatially correspond with pixels of the original image are black in response to the spatially corresponding pixels of the original image having a brightness value less than the brightness value of the spatially corresponding pixels of the horizontally and vertically warped line pattern and (b) pixels of the engraving-style halftone image that spatially correspond

with pixels of the original image are white in response to the spatially corresponding pixels of the original image having a brightness value greater than or equal to the brightness value of the spatially corresponding pixels of the horizontally and vertically warped line pattern.

Curry discloses producing a computer-generated engraving plate (column 3, lines 64-66 of Curry), which is formed from halftone data (column 3, lines 60-65 of Curry).

Lathrop in view of Lohmeyer is combinable with Curry because they are from the same field of endeavor, namely digital image processing. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to warp the image based on a texture, as taught by Lathrop, in the form of the halftone pattern that would be required to make an engraving plate, as taught by Curry. The motivation for doing so would have been to provide a desired texture pattern that can then be stored and selected for use in the system taught by Lathrop (column 2, lines 66-68 of Lathrop). Therefore, it would have been obvious to combine Curry with Lathrop in view of Lohmeyer.

Lathrop in view of Lohmeyer and Curry does not disclose expressly that (a) pixels of the engraving-style halftone image that spatially correspond with pixels of the original image are black in response to the spatially corresponding pixels of the original image having a brightness value less than the brightness value of the spatially corresponding pixels of the horizontally and vertically warped line pattern and (b) pixels of the engraving-style halftone image that spatially correspond with pixels of the original image are white in response to the spatially corresponding pixels of the original image having a

brightness value greater than or equal to the brightness value of the spatially corresponding pixels of the horizontally and vertically warped line pattern.

Smitt discloses that, if the grayscale value of the original image pixel exceeds the threshold value (warped pixel value), then the output pixel for said original image pixel will be white (column 4, lines 48-50 of Smitt). Otherwise, said output pixel will be black (column 4, line 50 of Smitt).

Lathrop in view of Lohmeyer and Curry is combinable with Smitt because they are from the same field of endeavor, namely halftone image processing. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to output a black pixel if a pixel of said engraving-style halftone image that spatially correspond with a pixel of the original image in response to a spatially corresponding pixel of the original image, as taught by Lathrop in view of Lohmeyer and Curry, has a brightness value less than the brightness value of the spatially corresponding pixel of the horizontally and vertically warped line pattern, also taught by Lathrop in view of Lohmeyer and Curry; and output a white pixel if a pixel of said engraving-style halftone image that spatially correspond with a pixel of the original image in response to a spatially corresponding pixel of the original image, as taught by Lathrop in view of Lohmeyer and Curry, has a brightness value greater than or equal to the brightness value of the spatially corresponding pixel of the horizontally and vertically warped line pattern, also taught by Lathrop in view of Lohmeyer and Curry. The brightness value of the spatially corresponding pixel of the horizontally and vertically warped line pattern would act as the threshold taught by Smitt. The motivation for

doing so would have been that the aforementioned thresholding scheme is useful for creating the halftone dots needed for sending the required halftone output to a printer (column 4, lines 50-53 of Smitt). Therefore, it would have been obvious to combine Smitt with Lathrop in view of Lohmeyer and Curry to obtain the invention as specified in claims 21 and 29.

Further regarding claim 21: The system of claim 29 performs the method of claim 21.

Further regarding claim 28: Lathrop discloses the use of computational and storage resources (column 7, line 63 to column 8, line 2 of Lathrop). "Storage resources" would inherently be some form of computer-readable medium since computer graphics computations are to be performed (column 7, line 67 to column 8, line 2 of Lathrop). Performing computations on a computer inherently requires instructions in some form on said computer-readable medium. The computer-readable medium of claim 28 embodies the computer instructions for performing the method of claim 21.

Regarding claim 24: Lathrop discloses computing the magnitude and orientation of shading gradients (column 4, line 64 to column 5, line 2 of Lathrop) at many pixel locations, A, of the original image (figure 1(2); figure 2; and column 4, line 68 to column 5, line 2 of Lathrop) in response to values of the pixels at each location A of the original image (column 4, lines 60-63 of Lathrop) and pixels in the vicinity of the pixel at each location A of the original image (column 6, lines 43-47 of Lathrop).

Using the partial derivative values dU/dX, dU/dY, dV/dX and dV/dY is the same as using the gradient for a two-dimensional

space, $\vec{\nabla}\psi = \frac{\partial\psi}{\partial x}\hat{e}_x + \frac{\partial\psi}{\partial y}\hat{e}_y$. The values of dU/dX, dU/dY, dV/dX and dV/dY provide the magnitudes of the gradients, and the orientation expressed by the gradient vector $\vec{\nabla}\psi = \frac{\partial\psi}{\partial x}\hat{e}_x + \frac{\partial\psi}{\partial y}\hat{e}_y$ is the orientation of each gradient. In order to interpolate the initial data values (column 6, lines 43-47 of Lathrop), reliance on the values of pixels in the vicinity of the pixel at each location A is inherent since interpolation is impossible without other nearby values from which to perform the interpolation calculations.

Lathrop does not disclose expressly that said values of the pixels are brightness values of the pixels.

Lohmeyer discloses warping image data (column 5, lines 32-36 and column 6, lines 20-23 of Lohmeyer) based on pixel brightness values (column 13, line 63 to column 14, line 6 of Lohmeyer). A luminance value is a measure of the brightness of a pixel based on the constraints of the computer measurements.

Lathrop and Lohmeyer are combinable because they are from the same field of endeavor, namely warping digital image data. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to specifically use brightness values of pixels, as taught by Lohmeyer. The motivation for doing so would have been that warping based on the interpolated warping of pixel brightness values uses less memory and processes faster (column 2, lines 10-17 of Lohmeyer). Therefore, it would have been obvious to combine Lohmeyer with Lathrop to obtain the invention as specified in claim 24.

Regarding claim 25: Lathrop discloses weighing the contributions of the pixels in the vicinity of the pixel at each

location A (column 4, lines 64-68 of Lathrop) in accordance with the distance between the pixel at each locations A and the pixels in the vicinity of the pixel at each location A (column 4, line 68 to column 5, line 2 of Lathrop). Each pixel value has a corresponding address (column 4, lines 57-60 of Lathrop). Interpolation is performed on the pixels (column 4, lines 64-68 of Lathrop) based on the pixel value and the pixel address (column 4, line 68 to column 5, line 2 of Lathrop), thus providing the gradients (column 4, lines 64-68 of Lathrop). Interpolation provides the weighting factors. Further, since pixel values are based on pixel location, and the gradients with respect to the X and Y directions are determined, then the contributions of the pixels in the vicinity of the pixel at each location A are weighed in accordance with the distance between the pixel at each locations A and the pixels in the vicinity of the pixel at each location A.

8. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lathrop (US Patent 5,097,427) in view of Lohmeyer (US Patent 6,061,477), Curry (US Patent 5,696,604), Smitt (US Patent 5,988,504), and well-known prior art.

Regarding claim 26: Lathrop discloses performing interpolation on pixels (column 4, lines 64-68 of Lathrop) based on the positions of the pixel at location A and the pixels in the vicinity of the pixel at location A (column 4, lines 57-60 and column 4, line 68 to column 5, line 2 of Lathrop). Further, the gradients are calculated for each pixel (column 4, lines 64-68 of Lathrop).

Official notice is taken that the magnitude of a vector $\vec{\nabla}\psi = \frac{\partial\psi}{\partial x}\hat{e}_x + \frac{\partial\psi}{\partial y}\hat{e}_y$ is calculated using the equation $\left|\vec{\nabla}\psi\right| = \sqrt{\left(\frac{\partial\psi}{\partial x}\right)^2 + \left(\frac{\partial\psi}{\partial y}\right)^2}$ and the orientation of a vector is calculated using the equation $\angle\vec{\nabla}\psi = \tan^{-1}\left[{(\partial\psi/\partial y)}\big/{(\partial\psi/\partial x)}\right]$.

Thus, for an interpolation operation at location A, the magnitude and orientation of the shading gradients are computed in accordance with $V_{mag}(x,y) = \sum_j^2 \sum_i^2 w_{mag}(i,j)\cdot G_{mag}(x-i,y-j)$ and $V_{dir}(x,y) = \sum_j^2 \sum_i^2 w_{dir}(i,j)\cdot G_{dir}(x-i,y-j)$, respectively, where $w_{mag}(i,j)$ and $w_{dir}(i,j)$ are weighting coefficients for a pixel displaced from the pixel at each location A by i pixels in the x-direction and j pixels in the y-direction. $G_{mag}(x,y) = \left[(\delta A/\delta x)^2 + (\delta A/\delta y)^2\right]^{1/2}$ and $G_{dir}(x,y) = \tan^{-1}\left[{(\delta A/\delta y)}\big/{(\delta A/\delta x)}\right]^{1/2}$ where $\delta A/\delta x$ is the rate of change of brightness of the pixel at each location in the x direction of the original image; and $\delta A/\delta y$ is the rate of change of brightness of the pixel at each location in the y direction of the original image. Using the same terms as the Lathrop, $\delta A/\delta x$ corresponds to dU/dX and dV/dX (gradient for each table parameter in the X direction) and $\delta A/\delta y$ corresponds to dU/dY and dV/dY (gradient for each table parameter in the Y direction). $w_{mag}(i,j)$ and $w_{dir}(i,j)$ correspond to the coefficients that would naturally be produced during the interpolation calculations.

Allowable Subject Matter

9. Claims 22-23 and 30-31 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: Claims 22 and 30 recite: (a) obtaining brightness values of pixels along a series of lines extending in a first of the horizontal or vertical directions of the original image; (b) deriving a gray level distribution curve in response to the brightness values of the pixels along each of the lines; (c) determining the spacing between adjacent halftone dots of each gray level distribution curve such that the areas of the gray level distribution curve between the adjacent dots are substantially the same, each line being formed by a search window including the pixels in the line and a predetermined number of pixels removed from the line in the second direction; and (d) for pixels on the line, summing the spacing of the halftone dots in the search window to obtain warping displacement values for pixels along the line so as to form a series of warped brightness pattern lines extending in the first direction.

Examiner has been unable to find each and every one of these specific limitations in the prior art such that the prior art would render the limitations of claims 22 and 30 obvious to one of ordinary skill in the art at the time of the invention. While (a) is taught by Lathrop in view of Lohmeyer, and the gray level distribution curves in (b) are taught by Smitt (figures 6 and 7 of Smitt), the full recitation of (c) and (d) are not

found in the previously cited prior art, nor has Examiner found additional prior art that teaches (c) and (d) such that (c) and (d) would have been obvious to one of ordinary skill in the art at the time of the invention.

Claims 23 and 31 are considered to contain allowable subject matter at least by virtue of their dependence from claims 22 and 30, respectively.

Conclusion

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to James A. Thompson whose telephone number is 571-272-7441. The examiner can normally be reached on 8:30AM-5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David K. Moore can be reached on 571-272-7437. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

James A. Thompson
Examiner
Art Unit 2624

JAT

08 September 2005

THOMAS D. ~~TOMMY~~ LEE
PRIMARY EXAMINER